APPARATUS AND METHOD TO IDENTIFY POTENTIAL WORK-AT-HOME CALLERS

BACKGROUND OF THE INVENTION

[0001] In modern switched telecommunications systems (in particular, modern PSTNs) it has become common practice to provide two related but separate network infrastructures: a bearer or transmission network for carrying end-user voice and data traffic, and a signaling network for controlling the setup and release of bearer channels through the bearer network in accordance with control signals transferred through the signaling network. In practice, such signaling networks comprise high-speed computers interconnected by signaling links, wherein procedures control the computers to provide a set of operational and signaling functions in accordance with a standardized protocol. One example of such a signaling protocol is the Common Channel Signaling System No. 7 (often referred to as SS7 or C7) that is being extensively deployed for control of telephone and other data transmission networks.

SS7 is a global standard for telecommunications defined by the International Telecommunication Union (ITU) Telecommunication Standardization Sector (ITU-T). The standard defines the procedures and protocol by which network elements in the public switched telephone network (PSTN) exchange information over a digital signaling network to effect wireless (cellular) and wireline call setup, routing and control. The ITU definition of SS7 allows for national variants such as the American National Standards Institute (ANSI) and Bell Communications Research (Telcordia Technologies) standards used in North America and the European Telecommunications Standards Institute (ETSI) standard used in Europe.

[0002] An SS7 network basically comprises various types of signaling points, namely, Signaling End Points (SEPs), for example an end office or local exchange, and Signaling Transfer Points (STPs) interconnected by signaling links. The SEPs typically comprise Signaling Switching Points (SSPs); Mobil Switching Centers (MSPs); and Service Control Points (SCPs).

[0003] The signaling information is passed over the signaling links in messages, which are called signal units (SUs). There are three types of SUs: message signal units (MSUs), link status signal units (LSSUs) and fill-in signal units (FISUs). The MSU is the workhorse in that signaling associated with call setup and tear down, database query and response, and SS7 management is carried by Message Signal Units (MSUs).

[0004] Many switches, including SS7 compliant switches, generate Call Detail Records (CDRs) which are data structures containing information about a call. CDRs are analyzed to provide information that can assist with service assurance, fulfillment and billing problems. Non-SS7 switches generate CDRs by monitoring the actual call and typically have a vendor specified format. Know SS7 operations support systems (OSS systems), such as the AGILENT TECHNOLOGIES ACCESS7 system, extract data from the MSUs to generate Call detail Records (CDRs). Because the data collection is independent of the network elements, SS7 CDRs may be presented in a consistent format across various OSS systems. In fact, there is at least one serious attempt to standardize the format of SS7 CDRs. This interoperability, among other benefits, has spurred the growth of SS7 networks and has led to an increasing amount of traffic over SS7 networks. As the volume of CDRs increases, users seek to extract more and more useful information from the data contained in the CDRs.

[0005] The desire for advanced analysis of CDRs has lead to the creation of a class of systems, termed Business Intelligence systems (BI systems), such as the Agilent Technologies, Inc. acceSS7 Business Intelligence system, that provide enrichment and analytical studies on CDRs. Known BI systems analyze SS7 CDRs to provide a variety of information about the SS7 network, for example: identification of signaling problems, location of network problems, service assurance data, billing data, quality of service monitoring, regulatory monitoring, and verifying compliance of inter-carrier agreements regarding billing and service level.

[0006] The differentiator between competing OSS and BI systems is the ability of the system to reduce operating cost or generate revenue for the users, including Local Exchange Carriers (LECs) and Inter-exchange Carriers (IXCs). To date, most of the focus of development has been on identifying problems with the network and verifying billing data. The present

inventors have identified method and apparatus for deriving marketing data from collected SS7 CDRs that allows the targeting of customers for new services.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] An understanding of the present invention can be gained from the following detailed description of the invention, taken in conjunction with the accompanying drawings of which:

[0008] *FIG. 1 is a block diagram of a signaling network.*

[0009] FIG. 2 is a block diagram of a Business Intelligence system in accordance with a preferred embodiment of the present invention.

[0010] FIG. 3 is a flow chart of a method according to an embodiment of the present invention adapted to identify work-at-home users.

[0011] FIG. 4 is a screen shot of a report produced using a method in accordance with a preferred embodiment of the present invention.

DETAILED DESCRIPTION

[0012] Reference will now be made in detail to the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout.

[0013] The detailed description that follows is presented in terms of general procedures and symbolic representations of operations of data within a computer memory, associated computer processors, networks, and network devices. These procedure descriptions and representations are the means used by those skilled in the data processing art to convey the substance of their work to others skilled in the art. As used herein the term "procedure" refers to a series of operations performed by a processor, be it a central processing unit of a

computer, or a processing unit of a network device, and as such, encompasses such terms of art as: "software," "objects," "functions," "subroutines" and "programs."

[0014] The apparatus set forth in the present application may be specifically constructed for the required purposes or it may comprise a general-purpose computer or terminal selectively activated or reconfigured by a computer program stored in the computer. The procedures presented herein are not inherently related to any particular computer or other apparatus. In fact, many of the procedures described herein may be implemented on a general-purpose computing device.

[0015] The present invention, as described, can be implemented using AGILENT's ACCESS7 OSS system, BI system, and associated hardware. The ACCESS7 OSS system integrates with and monitors an SS7 network as described above. Those of ordinary skill in the art will recognize that there exist other platforms and languages for creating software for performing the procedures outlined herein. Further, the present invention is useable with a variety of signaling systems. For example, the present invention can be implemented on any switched system that produces CDRs with the base data described herein. Those of ordinary skill in the art also recognize that the choice of the exact platform and language is often dictated by the specifics of the actual system constructed, such that what may work for one type of signaling system may not be efficient on another type of signaling system.

[0016] FIG. 1 is a block diagram of a signaling network 100. FIG. 2 is a block diagram of a Business Intelligence system (BI system) 200 in accordance with a preferred embodiment of the present invention. The structure illustrated in FIGs. 1 and 2 and the method illustrated in FIG. 3 emphasize certain features of the present invention while simplifying other features to aid in explanation. As such, the figures and associated discussion are to be regarded as illustrative and exemplary and not limiting as regards the invention described herein or the claims attached hereto. It will also be appreciated by those of ordinary skill in the relevant arts that the apparatus, as illustrated in FIGs. 1 and 2, and the methods of use thereof as described hereinafter with reference to FIG. 3, are intended to be representative of such structures and methods. Further, any given system may differ significantly from that shown, particularly in the details of construction and operation of such system, as still fall within the spirit and scope of the invention.

[0017] The signaling network 100 supports an SS7 signaling protocol and comprises a wireless network terminating device such as PCS handset 102 coupled to a MSC 104. The MSC 104 is capable of establishing a connection 106 with a SSP 108 and vice versa, the SSP 108 being coupled to a network-terminating device such as a telephone handset 110. The details of such connection are outside the scope of the present invention and are omitted to avoid obscuring the present invention.

[0018] The MSC 104 is coupled to a first STP 112 by a first A link 114 and a second STP 116 by a second A link 118. The first STP 112 is coupled to the second STP 116 by a first C link 113 and, together, the first and second STPs 112, 116 constitute a first mated pair of STPs 120. A first Agilent® acceSS7 Network Monitoring System (NMS) comprises a first secondary collector unit 122 and a first primary collector unit 115. The first primary collector unit 115 is, although not essentially, co-located with the first STP 112 and coupled to first links (not shown) provided by the first STP 112 by a first number of electrical connections 117 corresponding to the first links. Similarly, although not essentially co-located, in this example the first secondary collector unit 122 is co-located with the second STP 116 and coupled to second links (not shown) provided by the second STP 116 by a second number of electrical connection 124 corresponding to the second links.

[0019] The first STP 112 is coupled to a third STP 126 by a first B link 128 and a fourth STP 130 by a second B link 132. The second STP 116 is also coupled to the third STP 126 by a third B link 134 and the fourth STP 130 by a fourth B link 136. The third STP 126 is coupled to the fourth STP130 by a second C link 138 and, together, the third and fourth STPs 126, 130 constitute a second mated pair of STPs 140. The third STP 126 is coupled to the SSP 108 by a third A link 146 and an SCP 148 by a fourth A link 150. The fourth STP 130 is also coupled to the SSP 108 and the SCP 148, but by a fifth A link 152 and a sixth A link 154, respectively.

[0020] A second Agilent® acceSS7 NMS comprises a second primary collector unit 141 and a second secondary collector unit 142. For the purposes of the present invention, the structure of the second primary collector 141 may be considered (although not always) identical to the structure of the first primary collector 115 and the structure of the second secondary collector 142 may be considered (although not always) identical to the structure of

the first secondary collector 122. The second primary collector unit 141, although not essentially, is co-located with the third STP 126 and coupled to third links (not shown) provided by the third STP 126 by a third number of electrical connection 143 corresponding to the third links. Similarly, although not essentially co-located, in this example the second secondary collector unit 142 is co-located with the fourth STP 130 and coupled to fourth links (not shown) provided by the fourth STP 130 by a fourth number of electrical connection 144 corresponding to the fourth links.

[0021] The first and second primary collectors 115 and 141 are coupled to a wide area network (WAN) 156 through which connections to any number and variety of computing devices can be made. In the example shown in FIG. 1, two servers, 158 and 160, are shown. Generally, the collectors 115, 122, 141, and 142 collect data regarding messaging traffic on the SS7 network and create CDRs. Analysis of the CDRs can be performed by any number of capable units, for example the collectors 115, 122, 141, and 142 along with any computing device connected to the WAN 156, such as the servers 158 and 160.

[0022] FIG. 2 is a block diagram of a Business Intelligence (BI) system 200 in accordance with a preferred embodiment of the present invention. While shown as a single logical entity, the BI system 200 may be physically distributed, or centralized, to any available storage and processor resources connected to the network. It may prove useful to distribute the functions of the BI system 200 among the first and second primary collectors 115 and 141 and at least one server, such as the server 158.

[0023] The BI system 200 receives Call Detail Record (CDRs) from a CDR feed 202. The CDR feed 202 is connected to a network (not shown), such as the SS7 network shown in FIG. 1, via connection 201. In the example shown in FIG. 2, the CDR feed 202 is embodied in software and is programmable to configure, manage and control the collection and delivery of CDRs from the SS7 network. The CDR feed 202 can be configured to collect data from a single site, a number of sites or network-wide.

[0024] The CDR feed 202 feeds CDRs to one or more Data Management Components (DMC) 204, where the data is stored. This DMC 204 provides data storage and management for CDRs delivered by the CDR Feed 202. Using the Agilent Technologies' ACCESS7 OSS

as an example, the DMC 204 provides a consistent open interface for a wide range of acceSS7 Business Intelligence applications, enabling them to be designed independently of the underlying network infrastructure. While only a single DMC 204 is shown, it is fairly typically to set up a plurality of DMCs 204. For example, it is not uncommon to assign an individual DMC 204 for each separate yet concurrent analysis tasks or for each business unit. DMCs are known by a variety of names, which varies by vendor, such as a data management center, data management system, management site, etc... The CDR feed 202 and the DMC 204 are known parts of the Agilent® acceSS7 and will not be described further.

[0025] Business Intelligence applications 206 and Real-Time Business Intelligence applications 208 are sets of procedures that turn raw data into business information. The Business Intelligence applications 206 sit on top of the DMC and process the CDR data in large batches, typically every 24 hours. However, some requirements can only be met with data available in real-time. In some cases this can be accomplished by reducing the batch collection time, to say five minutes. If true real-time is required, the Real-Time BI applications 208 are configured to accept a direct feed from the CDR Feed 202. The BI applications 206 and Real-Time BI applications 208 output a variety of reports 210 and 212 respectively. The report varies with each application 206 and 208, and based on the function thereof. Additionally, the BI applications 206 and Real-Time BI applications 208 may be provided with dedicated storage space 214, for example of any of the servers 158, 160 connected to the network.

[0026] Currently, a wide variety of BI application and Real-Time BI applications are available from AGILENT TECHNOLOGIES. For example, an Interconnect Analysis application performs direct, accurate measurements of inter-carrier traffic, with measures of total calls and total MOU for each jurisdiction (e.g. local, toll, etc.). Bills and Rating Factors submitted by interconnecting carriers for jurisdictional reporting on originating, terminating and transit traffic can be validated and hard evidence provided with which to challenge estimates. ISP traffic can be identified and reported separately, which supports both separate rates for ISP traffic and the generation of data with which to build a case for ISP tariffs. Another BI application, the Call Performance Manager, provides detailed data on the call completion performance of interconnected carriers, including performance to specific destinations and services identified by leading digits. Yet another example is the Traffic

Analysis application that provides detailed analysis of traffic flows between parts of the network with analysis by geographic region.

[0027] Of particular relevance to at least one embodiment of the present invention is the ISP Finder. The ISP finder is a BI application that identifies ISPs on a connected network and on interconnected networks by matching the call profile of every called number against the typical profile of ISPs. This data is currently used for network planning purposes by identifying a major source of network congestion.

[0028] An understanding of the type of data contained in a CDR may prove helpful to understand the present invention. Table 1 is an example of a CDR specification used by business intelligence applications associated with AGILENT's ACCESS7 OSS.

[0029] TABLE 1

Field Name	Description
CDR_DATE	The date that the CDR was loaded into the repository.
CDR_ID	A sequence numbers for the CDR. This can be used to link this table row to a row in another table. This is useful for enriching a CDR with rating information, etc.
DMC_ID	Each Data Management Center (DMC) in the world has an identifier that is encrypted in the product activation license. Tagging a CDR with this identifier allows the originating DMC to be determined in situations where data is handed off between DMC systems.
PARTITION_ID	Each Oracle partition has an identifier. This field is used primarily to bin CDRs into the correct partition and has little user value.
STUDY_ID	A sequence number for a specific acceSS7 filter configuration over a specified period of time. Tagging a CDR with this identifier allows the determination of the exact acceSS7 configuration (filters, links...) that caused this CDR to be collected.
CLASS_ID	The acceSS7 class ID that is associated with this CDR.
SITE_ID	Specifies the acceSS7 site number that collected this CDR.
TIMEZONE	Specifies the time zone upon which all times in the

	CDR are based.
INCOMPLETE_FLG	A flag that specifies that acceSS7, was not able to completely populate the CDR.
CALL_IN_PROGRESS_FLG	A flag that specifies a call that is still in progress.
CALL_TIMEOUT_FLG	A flag that specifies that an acceSS7 timeout occurred before all parts of a call were collected.
REPEATING_CALL_IN_PROGRESS _FLG	
FORCED_DELIVERY_FLG	
OPC_1	The 1st component of the originating point code.
OPC_2	The 2nd component of the originating point code.
OPC_3	The 3rd component of the originating point code.
DPC_1	The 1st component of the destination point code.
DPC_2	The 2nd component of the destination point code.
DPC_3	The 3rd component of the destination point code.
CALLING_NUMPLAN	
CALLING_NPA	The NPA component of the calling number.
CALLING_NXX	The NXX component of the calling number.
CALLING_LINE	The LINE component of the calling number.
CALLING_INT_NUM	The entire calling number if the number is thought to be international.
CALLING_PARTY_CAT_CD	
CALLED_NPA	The NPA component of the called number.
CALLED_NXX	The NXX component of the called number.
CALLED_LINE	The LINE component of the called number.
CALLED_INT_NUM	The entire called number if the number is thought to be international.
CHARGE_NPA	The NPA component of the charge number.
CHARGE_NXX	The NXX component of the charge number.
CHARGE_LINE	The LINE component of the charge number.
CHARGE_INT_NUM	The entire charge number if the number is thought to be international.
CALLED_NUMPLAN	
IAM_DATE_TIME	The initial address message date/timestamp (nearest second).
IAM_MILLISEC	The initial address message timestamp (milliseconds component).

ANM_DATE_TIME	The answer message date/timestamp (nearest second).
ANM_MILLISEC	The answer message timestamp (milliseconds component).
REL_DATE_TIME	The release message date/timestamp (nearest second).
REL_MILLISEC	The release message timestamp (milliseconds component).
EXM_DATE_TIME	The exit message date/timestamp (nearest second).
EXM_MILLISEC	The exit message timestamp (milliseconds component).
ACM_DATE_TIME	The address completes message date/timestamp (nearest second).
ACM_MILLISEC	The address completes message timestamp (milliseconds component).
RLC_DATE_TIME	The release-clear message date/timestamp (nearest second).
RLC_MILLISEC	The release-clear message timestamp (milliseconds component).
IAM_REL_DUR	Time duration between IAM and REL messages (seconds).
IAM_REL_CCS	Time duration between IAM and REL messages (CCS).
ANM_REL_DUR	Time duration between ANM and REL messages (seconds).
ANM_REL_CCS	Time duration between ANM and REL messages (CCS).
CALLING_NATR_ADDR_CD	Acronym describing the context of the calling number derived from the calling nature of address indicator.
CALLING_NATR_ADDR_IND	Raw calling nature of address indicator.
CALLING_EVEN_ODD_FLG	Even/odd number of address signals for calling number.
CALLED_NATR_ADDR_CD	Acronym describing the context of the called number derived from the called nature of address indicator.
CALLED_NATR_ADDR_IND	Raw called nature of address indicator.
CALLED_EVEN_ODD_FLG	Even/odd number of address signals for called number.
CHARGE_NATR_ADDR_CD	Acronym describing the context of the charge number derived from the charge nature of address indicator.
CHARGE_NATR_ADDR_IND	Raw charge nature of address indicator.
CHARGE_EVEN_ODD_FLG	Even/odd number of address signals for charge number.
ORIG_LINE_CD	Represents toll class of service for the call.
CARRIER_ID_CD	Identifies the carrier selected by the caller.

CARRIER_SELECT_CD	Identifies how the caller selected a carrier.
TCIC	Trunk circuit identification code.
JURISDICTION	Numerical data indicating the geographic origination of the call.
BACKWD_CHARGE_CD	Backward charge indicator for called party.
BACKWD_CALLED_STAT_CD	Backward called party's status indicator.
BACKWD_CALLED_CAT_CD	Backward called party's category indicator.
BACKWD_END_TO_END_CD	Backward end-to-end method indicator.
BACKWD_INTERWORK_FLG	Backward interworking indicator.
BACKWD_IAM_SEG_FLG	Backward IAM segmentation indicator.
BACKWD_ISUP_FLG	Backward ISDN user part indicator.
BACKWD_HOLDING_FLG	Backward holding indicator.
BACKWD_ISDN_ACCESS_FLG	Backward ISDN access indicator.
BACKWD_ECHO_CNTL_FLG	Backward echo control device indicator.
BACKWD_SCCP_CD	Backward SCCP method indicator.
RELEASE_CAUSE_CD	Indicates the reason for releasing a specific connection. Note CDRs are generated for failed calls as well as successful calls.
RELEASE_LOC_CD	Indicates where the release was initiated.
TRANSIT_NETWORK_CD	Indicates the long distance carrier or transit network to be used to carry this call. This is used whenever the call is an inter-LATA call or international call.
ORIG_CALLED_NUMPLAN	
ORIG_CALLED_NPA	Used when call redirecting (forwarding) occurs. Identifies the NPA component of the number of the party that initiated the redirection.
ORIG_CALLED_NXX	Used when call redirecting (forwarding) occurs. Identifies the NXX component of the number of the party that initiated the redirection.
ORIG_CALLED_LINE	Used when call redirecting (forwarding) occurs. Identifies the LINE component of the number of the party that initiated the redirection.
ORIG_CALLED_INT_NUM	Used when call redirecting (forwarding) occurs. Identifies the entire number of the party that initiated the redirection if this number is thought to be international.
ORIG_CALLED_NATR_ADDR_IND	Raw original called number nature of address indicator.

REDIRECT_NPA	Used when call redirecting (forwarding) occurs. Identifies the NPA component of the number to which the called number is to be redirected.
REDIRECT_NXX	Used when call redirecting (forwarding) occurs. Identifies the NXX component of the number to which the called number is to be redirected.
REDIRECT_LINE	Used when call redirecting (forwarding) occurs. Identifies the LINE component of the number to which the called number is to be redirected.
REDIRECT_INT_NUM	Used when call redirecting (forwarding) occurs. Identifies the number to which the called number is to be redirected if this number is thought to be international.
REDIRECT_NATR_ADDR_IND	Raw redirecting number nature of address indicator.
ORIG_REDIRECT_REASON_CD	Indicates the reason the original redirection occurred.
REDIRECT_REASON_CD	Indicates the reason for subsequent redirection.
REDIRECT_COUNT	Indicates the number of redirections that have occurred.
FORWD_IN_INT_CALL_FLG	Forward incoming international call indicator.
FORWD_END_TO_END_CD	Forward end-to-end method indicator.
FORWD_INTERWORK_FLG	Forward interworking indicator.
FORWD_IAM_SEG_	FLG Forward IAM segmentation indicator.
FORWD_ISUP_FLG	Forward ISDN user part indicator.
FORWD_ISUP_PREF_CD	Forward ISDN user part preference indicator.
FORWD_ISDN_ACCESS_	FLG Forward ISDN access indicator.
FORWD_SCCP_CD	Forward SCCP method indicator.
FORWD_PORTED_NUM_FLG	Forward ported number translation indicator.
LRN_NPA	Used with Local Number Portability (LNP). Indicates the NPA component of the local routing number.
LRN_NXX	Used with Local Number Portability (LNP). Indicates the NXX component of the local routing number.
LRN_LINE	Used with Local Number Portability (LNP). Indicates the LINE component of the local routing number.
LRN_INT_NUM	Used with Local Number Portability (LNP). Identifies the local routing number if this number is thought to be international.
GAP_NPA	Indicates the NPA component of the Generic Address Parameter (GAP) number. When LNP is provided, the GAP provides the actual dialed digits for a ported number.

GAP_NXX	Indicates the NXX component of the Generic Address Parameter (GAP) number. When LNP is provided, the GAP provides the actual dialed digits for a ported number.
GAP_LINE	Indicates the LINE component of the Generic Address Parameter (GAP) number. When LNP is provided, the GAP provides the actual dialed digits for a ported number.
GAP_INT_NUM	Indicates the Generic Address Parameter (GAP) number if the number is thought to be international. When LNP is provided, the GAP provides the actual dialed digits for a ported number.
GAP_TYPE_OF_ADDR_IND	Indicates the type of address contained in the Generic Address Parameter (GAP).
GAP_NATR_OF_ADDR_IND	Raw Generic Address Parameter (GAP) nature of address indicator.
OUT_TRUNK_GROUP_NUM	Outgoing trunk group number.
SERVICE_CODE_CD	Service code assigned by the North American Numbering Plan Administration. Can be used to identify a specific type of service.
CIP_SEQ_NUM	This is a number assigned sequentially from 0 for each CDR pertaining to the same leg of the same call. For example, if RCIP/CIP CDRs are configured, the first CIP CDR has a sequence number of 0, the first RCIP CDR has a sequence number of 1, the second RCIP CDR has a sequence number of 2 and so on. With CIP CDRs, but no RCIP CDRs, the CIP CDR has a sequence number of 0 and the final CDR a sequence number of 1. With no CIP CDRs at all, the final CDR has a sequence number of 0.
CIP_CORRELATION_ID	This is an identifier which is the same for all CIP CDRs which apply to the same leg of the same call (and different from all other CIP CDRs)
CIP_START_TIME	The start time of the period covered by this call in progress CDR (accurate to 1 second)
CIP_START_MILLISEC	The milliseconds portion of the CIP_START_TIME
CIP_END_TIME	The end time of the period covered by this call in progress CDR (accurate to 1 second)
CIP_END_MILLISEC	The milliseconds portion of the CIP_END_TIME
CORRELATION_ID	Sequences number for a correlated set of CDRs. Given a CDR that is a member of a correlated set, this can be used to find the other members of the correlated set.
CORRELATION_DUPLICATE_FLG	This flag indicates that this CDR is thought to be identical to another CDR within the set of CDRs to be correlated.

CORRELATABLE_FLG	This flag indicates that this CDR is thought to be complete enough to be included in the correlation processing.
ENRICHED_CALLING_NPA	Contains the CALLING_NPA to be used in the correlation process. Local number portability, number completion, etc can influence the contents of this column.
ENRICHED_CALLING_NXX	Contains the CALLING_NXX to be used in the correlation process. Local number portability, number completion, etc can influence the contents of this column.
ENRICHED_CALLING_LINE	Contains the CALLING_LINE to be used in the correlation process. Local number portability, number completion, etc can influence the contents of this column.
ENRICHED_CALLING_INT_NUM	Contains the calling digits to be used in the correlation process in the event they are thought to be an international number. Local number portability, number completion, etc can influence the contents of this column.
ENRICHED_CALLED_NPA	Contains the CALLED_NPA to be used in the correlation process. Local number portability, number completion, etc can influence the contents of this column.
ENRICHED_CALLED_NXX	Contains the CALLED_NPX to be used in the correlation process. Local number portability, number completion, etc can influence the contents of this column.
ENRICHED_CALLED_LINE	Contains the CALLED_LINE to be used in the correlation process. Local number portability, number completion, etc can influence the contents of this column.
ENRICHED_CALLED_INT_NUM	Contains the called digits to be used in the correlation process in the event they are thought to be an international number. Local number portability, number completion, etc can influence the contents of this column.
CORRELATION_CONFIDENCE	This parameter indicates the degree of confidence associated with the correlation of this CDR with other CDRs. This is a bit-wise parameter where each bit has a specific meaning.
CROSS_CORRELATION_ID	

[0030] The term call detail record (CDR) refers to any electronic record of the details of a call including, for example, originating number (NPA/NXX), terminating number

(NPA/NXX), time, duration, etc... What constitutes a CDR varies by vendor and customer. Even within a single OSS family, different applications, such as billing, fraud detection, and business intelligence may direct the formation of CDRs with varying content. Further, there are several efforts at formulating standards from CDR content, such as ANSI standard TIA/EIA-124 Revision D for CDR content for wireless applications. The applicability of the present invention will remain regardless of the nomenclature, content and format of the electronic record that may vary from vendor to vendor and system to system.

[0031] In accordance with an embodiment of the present invention, the BI system 200 is improved by the addition of a new BI application (or modification to an existing BI application), which preferably operates in non-real-time (e.g. batch) mode, but may be operated in real-time mode. The new BI application identifies users of the network having certain characteristics that identify them as a certain type of user, for example a work-at-home user. It is to be understood, that while this embodiment of the present invention is being described as being integrated with the BI system 200, those of ordinary skill in the art will recognize that the present invention can be implemented as a stand-alone system. Further, while the present invention is described with respect to the use of CDRs, any data feed with the appropriate information may be utilized.

[0032] FIG. 3 is a flow chart of a method according to an embodiment of the present invention adapted to identify work-at-home users. In particular the method described in FIG. 3 is suitable for identifying work-at-homers that use dial-up ISPs. This can be potential valuable information for LECs that may wish to target such users with advertisements for other services such as DSL or a second line.

[0033] The method starts in step 300. In step 302, a set of ISP numbers is selected. This allows the requester to limit the subsequent report to a select number of ISPs. All ISPs on a network, or connected networks, can be identified using, for example, the ISP finder BI application discussed hereinabove available from Agilent Technologies, Inc. The set of ISP numbers can be limited to one or more ISPs of interest, or can be based on the NPA/NXX of the ISP or any other relevant factor. Of course, all identified ISPs can be selected.

[0034] Next, in step 304, the set of available CDRs is filtered based on the ISP numbers in the set. The output is a set of CDRs having CALLED_NPA, CALLED_NXX, and CALLED_LINE corresponding to one of the ISP numbers in the set. In step 306, the remaining CDRs are filtered to remove those with call origination times (using for example IAM_DATE_TIME) outside of normal business hours, such as 8:00AM to 6:00PM. In step 308, the remaining CDRs are filtered to identify those with a connect time of more than 4 hours (for example, the IAM_REL_DUR value which represent the difference between the release time and the call time).

[0035] Subsequently, in step 310, the CDRs remaining after the filters in steps 304 through 308 are analyzed to generate an exclusion list containing the calling numbers (i.e. CALLING_NPA; CALLING_NXX; and CALLING_LINE) that had connection time on the weekend. In step 312, the remaining CDRs are compared with the exclusion list and the CDR having originating numbers on the exclusion list are filtered out to leave those CDRs representing calls during business hours of greater than 4 hours to an identified ISP where the calling party did not connect on the weekend to the ISPs. Finally in step 314, by extracting the calling numbers from the remaining CDRs and eliminating duplicate entries a list of exclusive calling numbers is generated. This list of exclusive numbers may then be presented in a report to the requestor. The method end in step 316

[0036] TABLE 2 contains a procedure comprising a series of SQL commands that can produce a report in accordance with the example shown in FIG. 3. The commands in TABLE 2 take all daily CDR in a BI system and filters the lists to all local ISP terminated calls that have full 10-digit calling party number information. Then, it further filters the list such as only calls with connect time greater than 4 hours are included.

TABLE 2

```
SET ARRAY 100
SET ECHO OFF
SET FEED OFF
SET FLU OFF
SET HEA OFF
SET LIN 32767
SET PAGES 0
SET TERM OFF
SET TRIMS ON
SET VER OFF

DEF parallelism = 8
DEF tabspacename = 'STUDY'
DEF tabname = &1.
DEF mmdd = &2.
DEF tmp_tab_1 = 'jh_wah_&&mmdd._1'
DEF tmp_tab_2 = 'jh_wah_&&mmdd._2'
DEF tmp_tab_3 = 'jh_wah_&&mmdd._3'
DEF spool_file_1 = 'wah_s1.txt'
DEF spool_file_2 = 'wah_s2.txt'
DEF spool_file_3 = 'wah_s3.txt'
DEF outfile = 'wah_&&mmdd.txt'

ALTER SESSION ENABLE PARALLEL DML;
ALTER SESSION SET optimizer_mode        = all_rows;
ALTER SESSION SET sort_area_size        = 104857600;
 ALTER SESSION SET sort_area_retained_size = 104857600;

 DROP TABLE &&tmp_tab_1.;
spool &&spool_file_1.
CREATE TABLE &&tmp_tab_1.
        PARALLEL (DEGREE &&parallelism.) NOLOGGING PCTFREE 0 PCTUSED
99 TABLESPACE &&tabspacename.
        STORAGE (INITIAL 1M NEXT 1M PCTINCREASE 0 MAXEXTENTS
UNLIMITED) AS
SELECT /*+ PARALLEL (&tabname.,&&parallelism.) */
        TO_CHAR(iam_date_time,'D') dotw,
        TO_CHAR(iam_date_time,'HH24') hr,
        '('||enriched_calling_npa||')'||enriched_calling_nxx||'-'||enriched_calling_line cgpn,
        ia_called_state cd_st,
        ia_carrier_code ocn,
        ia_tgsn tgsn,
        anm_rel_dur/60 mou
FROM
        &tabname., tsdbi_dba.line_specific_current
WHERE
        enriched_called_npa||enriched_called_nxx||enriched_called_line=line_number
AND
```

```
        ia_call_category IN ('LOC','1S2LOC','2S2LOC','2S1LOC') AND
        length(enriched_calling_npa||enriched_calling_nxx||enriched_calling_line) = 10;

spool &&spool_file_2.
INSERT /*+ PARALLEL (&&tmp_tab_2.,&&parallelism.) */ INTO &&tmp_tab_2.
SELECT /*+ PARALLEL (&&tmp_tab_1.,&&parallelism.) */
        dotw,
        hr,
        cgpn,
        cd_st,
        ocn,
        tgsn,
        count(mou),
        sum(mou)
FROM
        &&tmp_tab_1.
HAVING
        avg(mou) > 3600
GROUP BY
        dotw, hr, cgpn, cd_st, ocn, tgsn;
spool off

DROP TABLE &&tmp_tab_1.;
--DROP TABLE &&tmp_tab_2.;
--DROP TABLE &&tmp_tab_3.;

EXIT
```

[0037] FIG. 4 is a screen shot of a report produced using a method in accordance with a preferred embodiment of the present invention. The report shown in FIG. 4 is but one example of a report that could be produced in accordance with the described embodiment of the present invention. In particular the report in FIG. 4 shows the calling number, the date and time of the call, along with the minutes of use. Those of ordinary skill in the art will recognize that the report shown in FIG. 4 can be produced in a variety of manners, including the use of the CRYSTAL REPORTS software package.

[0038] Although a few variations of the preferred embodiment of the present invention have been shown and described, it will be appreciated by those skilled in the art that changes may be made to the described invention without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents. For example,

while the discussion herein has focused on the analysis of CDRs, those of ordinary skill in the art recognize that other data structures may be substituted, such as Correlated Call Records (CCRs) that combine of two or more CDRs representing the same call. Also, the terms applied to the various data structures and procedures do not represent any particular data structure or procedure. In particular, the present discussion was presented in the context of AGILENT's ACCESS7 and adopts the nomenclature thereof. However, the present invention is applicable to other systems, which may use different nomenclature to describe similar structures and to which the present invention may be equally applied. Further, the described procedures may also be modified to account for process flows other than the described process flow used by the AGILENT's ACCESS7 OSS.